

METHODS AND APPARATUS FOR AUTOMATED FOOD PREPARATION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] U.S. Provisional Patent Application 62/417,336 filed Nov. 4, 2016, U.S. Provisional Patent Application 62/456,008 filed Feb. 7, 2017, U.S. Provisional Patent Application 62/471,957 filed Mar. 15, 2017, and U.S. Provisional Patent Application 62/522,671 filed Jun. 20, 2017. All these applications are incorporated herein by reference as if set forth in full herein.

STATEMENT OF FEDERALLY FUNDED RESEARCH

[0002] Not applicable.

FIELD OF THE INVENTION

[0003] This disclosure generally relates to the fields of robotics/automation and cooking/culinary arts.

SUMMARY

[0004] The automation of food preparation is of significant interest. A highly-automated food preparation system could offer significant benefits, offering a means of reducing labor that is frequently hard to find and costly; increasing the availability of quality food and allowing access in more locations and at more times; facilitating customization to individual tastes, nutritional requirements, and dietary restrictions; reducing the risk of foodborne illness caused by restaurant workers; increasing repeatability by making recipes more quantitative and ensuring they are followed accurately; etc.

[0005] It is an object of some embodiments of the invention to assure high ingredient quality by protecting ingredients before use from exposure to the environment, since air and moisture can cause oxidation, desiccation, sogginess, staleness, and other degradation which reduce palatability, and require frequent and wasteful restocking with fresh ingredients.

[0006] It is an object of some embodiments of the invention to assure food safety and hygiene by minimizing or eliminating durable components of the apparatus coming into direct contact with ingredients, since otherwise there is danger (without perfect cleaning) of cultivating harmful microbes, or of cross-contamination from other ingredients (including allergens such as peanuts), and if ingredients are not well protected, insects and other vermin may infest them.

[0007] It is an object of some embodiments of the invention to offer meal variety by providing dispensing methods and apparatus that are compatible with a very large range of ingredients, including those that might be too delicate, too large, too moist, etc. to dispense by other methods.

[0008] It is an object of some embodiments of the invention to provide efficient use of ingredients by minimizing waste when dispensing them.

[0009] Other objects and advantages of various embodiments of the invention will be apparent to those of skill in the art upon review of the teachings herein. The various embodiments of the invention, set forth explicitly herein or otherwise ascertained from the teachings herein, may address one or more of the above objects alone or in

combination, or alternatively may address some other object ascertained from the teachings herein. It is not necessarily intended that all objects be addressed by any single aspect of the invention even though that may be the case with regard to some aspects.

[0010] In a first aspect of the invention a method for automatically transferring at least one food ingredient within at least one sealed flexible package to a receptacle, includes: (a) providing ingredient dispensing means, the dispensing means comprising an actuator-operated mechanized means for unsealing the at least one package; (b) automatically operating the mechanized means to unseal the at least one flexible package; wherein the at least one food ingredient is substantially dispensed from the unsealed package into the receptacle.

[0011] Numerous variations of the first aspect of the invention are possible and include, for example: (1) additionally providing a temporary storage location for at least one sealed flexible package that contains at least one food ingredient; (2) variation (1) further including causing an actuator to operate a mechanical means for conveying the at least one sealed package from the temporary storage location to a location more proximate the receptacle; (3) additionally providing compressing means and operating the compressing means to compress the at least one package to assist in dispensing the at least one ingredient; (4) additionally providing a blade, and relatively moving the blade and the package such that at least a portion of the package is moved around the edge of the blade to assist in dispensing the at least one ingredient; (5) the package has at least two sides and wherein the means for unsealing includes gripping means for grasping at least one side of the package, and peeling means for pulling the at least one side of the package away from another side of the package; (6) (i) a base, and a first surface having at least one port for the passage of air; (ii) a sheet of material having a second and a third surface, the second surface able to contact the first surface of the base and conform to it when air is substantially withdrawn through the at least one port causing the first and second surfaces to come into close contact, and the third surface able to contact the food ingredient; (iii) means for further preparing the ingredient selected from the group consisting of 1) heating, 2) cooling, 3) freezing, 4) boiling, 5) evaporating, and 6) dehydrating; wherein one of the means of element (iii) is operated to further process the ingredient.

[0012] In a second aspect of the invention a method for transferring a food ingredient contained within a flexible package having at least one seal to a receptacle, includes: (a) providing an ingredient dispenser in proximity to the receptacle; (b) conveying the flexible package to the dispenser; (c) opening the at least one seal of the flexible package; wherein the food ingredient is dispensed from the flexible package into the receptacle.

[0013] Numerous variations of the first aspect of the invention are possible and include, for example: (1) comprising compressing the package to help express the ingredient; (2) providing a blade with an edge and pulling a portion of the package around the edge.

[0014] In a third aspect of the invention a method for dispensing a food ingredient from a package, includes: (a) providing a sealed package containing a food ingredient wherein the package comprises at least one flexible film divided into a left portion and a right portion with each portion having an inside and an outside surface with the